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BestPractices
Assessment Case Study

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ENERGY EFFICIENCY AND RENEWABLE ENERGY, U.S. DEPARTMENT OF ENERGY

IAC Energy Assessment of Spanish Fork Plant

Summary

In July 2000, the Industrial Assessment Center (IAC) at Colorado State University conducted an energy assessment at Alcoa's aluminum extrusion plant in Spanish Fork, Utah. The purpose of the assessment was to identify, evaluate, and recommend the most significant opportunities to conserve energy, prevent pollution, and increase productivity at the facility, while at the same time reducing production costs and increasing profits. The total annual cost savings resulting from implementation of the assessment recommendations is estimated to be $843,000 with a total implementation cost of less than $393,000. The payback period would be approximately 6 months.

Company Background

Alcoa, Inc., is the world's leading producer of primary aluminum, fabricated aluminum, and alumina. Alcoa is active in all major segments of the aluminum industry, including mining, refining, smelting, fabricating, and recycling. Alcoa provides the packaging, automotive, aerospace, and construction markets with a variety of fabricated and finished products. The company is composed of 24 business units, with 103,500 employees at 215 operating locations in 31 countries.

Alcoa's plant in Spanish Fork, Utah, produces extruded aluminum products for the automotive industry, electrical equipment, and miscellaneous other uses nationwide.

Alcoa's Aluminum Extrusion Plant at Spanish Fork, Utah

Benefits

- Reduces electric energy consumption
- Reduces peak electric demand
- Reduces natural gas consumption
- Reduces nonhazardous solid waste and wastewater generation
- Potential annual savings are approximately $843,000

Applications

The objective of the IAC's energy assessment was to identify, evaluate, and recommend the most significant opportunities for energy conservation, pollution prevention, and increased productivity. As a result, facility production costs can be reduced and profits can be increased.

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About 300 employees are involved in processing 82.4 million pounds of extruded products; in 1999, the plant had an annual sales figure of about $82 million. The plant operates 24 hours per day, 7 days per week, 52 weeks per year—or 8,760 hours every year.

Manufacturing at the facility includes both casting and extrusion processes. Process equipment, air compressors, lighting, office cooling, and miscellaneous loads use electricity to operate. Process furnaces for casting and extrusion, as well as space heating for the plant, use natural gas.

Assessment Overview

The energy assessment was performed under the direction of the IAC at Colorado State University. The IAC's objective is to identify, evaluate, and recommend the most significant opportunities to conserve energy, prevent pollution, and increase productivity, while at the same time reducing facility production costs and increasing profits.

Assessment Implementation

Recommendations are based on observations and measurements made in the plant. Because assessment time was limited, no attempt was made to compile complete details on the plant's energy production and consumption. However, specific and quantitative recommendations for cost savings, energy efficiency, pollution prevention, and productivity improvement were identified where possible. Designs and services that would normally be provided by an engineering firm, vendor, or manufacturer were not included in the assessment report.

Overview of Specific Actions Identified in the Assessment

The following are specific recommendations resulting from the IAC audit.

Turn off melt burners during the aluminum charging process. Two of four natural-gas-fired burners normally operate during the aluminum charging process. The charging process involves loading aluminum scrap and billets into the melt furnace. During this process, the door to the melt furnace remains open, and the flue heat recovery system is not used. As a result, the temperature of the flue gases increases from approximately 600°F to more than 1,600°F. Burner operation also encourages airflow within the furnace and increases furnace temperature, thereby increasing radiation and convection losses. The furnace is designed for maximum efficiency when the door is closed. By turning the burners off during the loading process, the burners will operate only when the furnace door is closed and when the furnace is operating most efficiently.

Minimize open time of melt furnace door. Minimizing the time that the melt furnace door is open reduces energy losses from radiation.

Turn off saw blow-off hose when not in use. One of the cut-off saws in the extrusion area has a compressed air blow-off hose that runs continuously. A solenoid valve should be incorporated into the input/output system that controls the saw to eliminate airflow to the hose when it is not in use. Savings would result from reduced electrical consumption and electrical demand charges.

Reduce peak electricity demand. An overall energy management scheme should be implemented. One strategy would be to identify the periods when peak electricity demand typically occurs and ensure that ancillary equipment is turned off at those times.

Reduce leakage of compressed air system. Leaks in the air lines of the compressed air system should be repaired on a regular basis. Reduced electricity consumption and demand charges would lead to significant energy savings because less power would be required to operate the compressed air system.

Table 1. Assessment Recommendations

Assessment Recommendations	Annual Resource Savings	Annual Cost Savings ($)	Implementation Cost ($)	Payback (years)
Energy Efficiency Recommendations				
Turn off melt burners while charging	23,455 MMBtu natural gas	74,960	1,050	0
Turn off saw blow-off hose when not in use	168,200 kWh 230 kW peak demand	6,150	400	0.1
Reduce peak electric demand	600 kW peak demand	6,360	10,000	1.6
Reduce compressed air leaks	171,900 kWh 235 kW peak demand	4,980	1,000	0.2
Install low-pressure blower for agitation of water quench tank	114,200 kWh 157 kW peak demand	4,180	6,780	1.6
Minimize open time of melt furnace door	394 MMBtu natural gas	1,260	500	0.4
Pollution Prevention Recommendations				
Install dross press	198,600 lbs nonhazardous solid waste 238 MMBtu natural gas	107,610	75,000	0.7
Increase chip recovery from extrusion saw	441,900 lbs nonhazardous solid waste	39,460	10,000	0.3
Productivity Improvement Recommendations				
Install furnace charging system	1,094 MMBtu natural gas Raw material savings	587,500	262,500	0.4
Install misters for production space cooling	(6,100) kWh (36) kW peak demand; 128,300 gal wastewater 529 hours labor savings	10,170	26,000	2.6
Totals		**$842,630**	**$393,230**	**0.5**

The peak electric demand is defined as the highest 15-minute period of energy usage during a billing cycle.

Install a low-pressure blower for agitation of the water quench tank. A low-pressure blower should be installed to provide agitation air for the water quench tank in the extrusion line. One 50-horsepower (hp) and two 75-hp air compressors are currently used. When the water quench tank is in use, tank agitation is a significant load. Use of low-pressure air from a regenerative blower instead of compressed air would reduce electrical consumption and associated costs by eliminating the practice of compressing air and then expanding it to a lower pressure.

Install a dross press. A dross press could be used to recover additional aluminum from the dross skimmed from melt and hold furnaces. Savings would result from decreased dross processing and from aluminum conservation.

Increase chip recovery from extrusion saw. A new briquetter could be modified to accept aluminum chips produced by the extrusion saw. These very small chips could then be compressed and reused as feedstock for the melt furnace. This process would eliminate the need to recycle aluminum chips through an expensive outside reclamation service.

Install a melt furnace charging system. A melt furnace loading system could be installed to reduce charge times, increase production, and decrease energy losses.

Install misters for production space cooling. Misters could be installed in selected work areas to provide space cooling for employees in the summer months. Blowdown water from the cooling towers could supply the misters, thereby reducing the amount of wastewater discharged. Savings would result from improved worker productivity and from reduced water costs.

Results and Recommendations

If implemented, the IAC assessment recommendations for the Spanish Fork plant would:

- reduce electric energy consumption by 448,200 kWh/year
- reduce peak electric demand by 1,186 kW/year (98.8 kW/month)
- reduce natural gas energy consumption by 25,181 MBtu/year
- reduce nonhazardous solid waste generation by 640,500 lbs/year
- reduce wastewater generation by 128,300 gal/year

The total cost savings resulting from implementation of the assessment recommendations is estimated to be $842,630 per year. The total implementation cost would be $393,230. Thus, the payback period would be approximately 6 months. Specific recommendations are listed in Table 1. Savings given reflect those achievable when implementing each opportunity independently.

Industry of the Future—Aluminum

Through OIT's Industries of the Future initiative, and on behalf of the aluminum industry, the Aluminum Association, Inc., has partnered with the U.S. Department of Energy (DOE) to spur technological innovations that will reduce energy consumption, pollution, and production costs. In March 1996, the industry outlined its vision for maintaining and building its competitive position in the world market in ***Aluminum Industry: Industry/Government Partnerships for the Future****.*

OIT Aluminum Team Leader: Sara Dillich (202) 586-7925.

BestPractices is part of the Office of Industrial Technologies' (OIT's) Industries of the Future strategy, which helps the country's most energy-intensive industries improve their competitiveness. BestPractices brings together the best-available and emerging technologies and practices to help companies begin improving energy efficiency, environmental performance, and productivity right now.

BestPractices focuses on plant systems, where significant efficiency improvements and savings can be achieved. Industry gains easy access to near-term and long-term solutions for improving the performance of motor, steam, compressed air, and process heating systems. In addition, the Industrial Assessment Centers provide comprehensive industrial energy evaluations to small- and medium-size manufacturers.

Project Partners

Industrial Assessment Center at
Colorado State University
Fort Collins, CO

Alcoa North American Extrusions
Spanish Fork, UT

For Additional Information, Please Contact:

OIT Clearinghouse
Phone: (800) 862-2086
Fax: (360) 586-8303
clearinghouse@ee.doe.gov

Visit our home page at
www.oit.doe.gov

Please send any comments, questions, or suggestions to
webmaster.oit@ee.doe.gov

Office of Industrial Technologies
Energy Efficiency
and Renewable Energy
U.S. Department of Energy
Washington, DC 20585-0121

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